FOSS ® HUMAN BODY
TEACHER PREPARATION VIDEO TRANSCRIPT

<Larry Lowery Introduction to FOSS Program>

Lowery: Hello. Welcome to the Full Option Science System. This program was funded by the National Science Foundation. Its goal was to develop materials that would involve youngsters with both the processes and the content of science.

The program is developed with the Lawrence Hall of Science, with scientists, science educators and teachers working together as a team to develop the materials. The materials are tested in the hands of teachers and children in classrooms. It takes about two years to turn out a module.

Each module begins with firsthand experiences. This is done because it has been found that firsthand experiences are the best way for youngsters to learn about the concepts of science. As the module progresses, children are introduced to abstractions and reading materials. The sequence from firsthand experiences through reading materials is deliberate because it has been found that youngsters, when they have some experience before they read, learn and understand more from the reading. Authors of reading materials can then take youngsters to greater abstractions.

Trust the materials that you are getting acquainted with. They have been well-tested. We found that they work extremely well in the hands of all teachers and are effective for youngsters in learning about science.

<Larry Lowery Introduction to Human Body Module>

The human body is a complex of parts that work together as a system. As a system, the parts enable us to move and to grow. Bones and muscles comprise one of the systems that can be directly studied. Students can feel their bones and muscles through their skin. They can move their bones and muscles to accomplish different tasks. They can study joints to see how they work.

This Human Body module moves students progressively through investigations of bones, joints and muscles. Each subsequent investigation builds upon knowledge learned in a prior investigation. In this tape, you will see the materials used in this module and you will see students actively engaged in the study of the bones and muscle systems of their own bodies.

<Denise Soderlund Introduction to Module>

Narrator/Denise Soderlund: Hi. My name is Denise Soderlund. And I'm here to help you get started with the FOSS Human Body kit. This module consists of four

investigations that will engage students in thoughtful activities about the form and function of a remarkable machine, their own human body. Most of the equipment you need to teach this module comes in the kit.

Everything you see here comes in this box. There is enough permanent equipment for a class of 32 students and consumable equipment for at least two classes. You will need to check the inventory sheet in the Materials folio to see which materials are consumable and which are permanent.

Included in the permanent collection are the Mr. Bones Puzzles, the arm and leg muscle transparencies and also two of each of the posters that you see here. This life size human body skeleton photo is also part of the kit.

From the FOSS Measurement Kit you will need the basins, one half liter containers and the meter tapes. You will need to supply some newspaper, scissors, un-popped popcorn, writing paper, pennies, transparent tape and owl pellets.

The Materials folio provides details on how to order your owl pellets. If your district purchased the FOSS Living Organism Coupons, you can fill out the information on the coupons and mail those to Delta or you can locate a local biological supply company and get them from there.

Before you begin teaching, it is important to look through the entire Teacher's Guide. First you will find the Overview folio which points out the national standards addressed in this module as well as information about how to make best use of the Teacher Guide. It also includes valuable background information specifically written for teachers who have not had extensive science training.

Next you'll find the Materials folio. If you are the first teacher using a new kit, you'll want to turn to the section that describes the first-time prep. If the kit has been used before, check the section called Preparing Your Kit for the Classroom. Both of these sections will give you helpful hints that will save lots of prep time later.

The next four folios are the investigation folios. These are the heart of the program. Each takes one or two weeks to complete.

The first page provides overview information. The At A Glance chart summarizes the investigations and helps you plan for assessment and extension activities. Next you'll find background information specific to this investigation. There is a section called Teaching Children About which gives you some insight into research about how children think and learn. Then for each part of the investigation, you'll find a Materials list, Getting Ready section and step-by-step instructions for how to proceed through the

investigation.

At the end of the folio, you'll find Interdisciplinary Extensions. You can do some of these extensions with the class or save them for students to use as projects at the end of the module.

Next are the investigation duplication masters. Each master is labeled with a number so it will be easy to find when you need it. Shortly before beginning this module, duplicate the Letter To Parents and send it home with the students. This letter tells parents about the module and suggests some activities they can do at home with the children.

It's important to read the Assessment folio before you begin teaching. It describes a system for assessing students throughout the investigations and also gives you ideas for end-of-the-module testing or portfolio assembly. The folio contains scoring guides for each of the assessments suggested.

Next are the assessment duplication masters. Here you'll find all the masters for the assessment charts and end-of-the-module assessments. The Science Stories folio provides background information and recommends when to read the stories and provides follow-up activities. You may want to read the Science Stories during a reading period rather than science time, especially if you only teach science a few times a week.

In the Resource folio, you will find lists of trade books, videos, computer software and other resources that you can use to enrich the program. The final tab is the FOSS website folio. On the website you'll find simulations for each module in the program. Students can contact scientists and FOSS students across the country. You'll need to check the website to see the many features available there, including resources for teachers.

If you're the first person to use this Human Body kit, you will need to prepare the Mr. Bones Puzzles. Each set contains two sheets of parts. Punch out the 19 parts and along with 18 paper fasteners put them in a plastic bag. First color-code the backs of the parts. It helps the students keep the set together. Plan to get an owl pellet for each pair of students in your class.

You will need to prepare eight task packages. Duplicate the student sheet Joint Tasks A and B. Cut out the task cards. In order to gather the materials for the task packages, you will need to look in the Teacher's Guide under Investigation 2, Materials. Gather the materials along with the task cards and place them in a zip plastic bag.

<Investigation 1, Part 1>

Narrator: This investigation begins with students jumping rope to explore the ways in which their body moves. Then they count the bones in the skeleton, first without visual

aids. Then we pass out posters and students use these aids to get a more accurate count.

For each part of the investigation you'll need to set up a Materials Station. For this part, you need the jump ropes. Later on you'll pass out the posters, which include the skull poster, human torso poster, the arm poster and the leg poster. You'll also hang the human body skeleton.

You'll need to provide paper and pencils. Duplicate Student Sheet No. 2 called Counting Bones and Assessment Chart for Investigation 1. Prepare Word Bank and Content/Inquiry charts using large sheets of paper or a flip chart.

Make a Project Folder for the class. As students come up with ideas about the investigation, they can write them down and put them in the folder. Then when they go to choose a project at the end of the module, they can look here.

Plan to take advantage of the many assessment opportunities throughout this module. In the Getting Ready section, you'll find a note on assessment. You'll have the opportunity to use teacher observation, response sheets, which correct student misinformation, performance base assessment and end-of-the-module assessment. In the Assessment folio you'll find all of the assessment masters and guidelines for portfolios. Familiarize yourself with the human body posters and the number of bones on each.

This session begins with the teacher explaining to the class that they are about to study one of the most fascinating machines.

Teacher: We are going to learn about one of the most exquisite machines ever made. And that would be your body. You guys are laughing. Your body is a machine, did you know that?

Class: No.

Teacher: It's not a mechanical machine. But it does things like move, right? And action. And a first activity we are going to do is going to help us look at the movement of our bodies. Okay?

You're going to work with your desk partner. We are going to go outside. And you are going to get an opportunity to jump rope. One person is going to jump first. While that person is jumping, their partner is going to watch their body really carefully to see what parts of the body are moving and working.

Student: Shoulders.

Narrator: After several minutes, partners switch places.

Teacher: So what did you notice while you were jumping and watching somebody jump? Brandy?

Student: When the person jumps up, their knee bends.

Teacher: Anthony?

Student: Their arms, their legs, their hair, their feet their knees and their mouth.

Teacher: You guys noticed some great things about how your bodies moved. I want you to think about now just your bones. Where are your bones?
Aaron?

Student: All around our body.

Teacher: All around your body.
Cecelia?

Student: Under your skin.

Teacher: Under your skin. How can you tell where your bones are?
Yvette?

Student: You can feel them.

Teacher: Tell me what you feel when you feel them.

Student: You feel hard things like a stick.

Teacher: You feel hard things like a stick. Yeah. Do you know what you call all of the bones, the whole system from here to there?
Samantha?

Student: Your skeleton.

Teacher: Right. All of the bones from here straight down to your toes are part of your skeletal system. Absolutely. How many bones do you think you have in your body all together? How many bones do you predict you have?
Aaron?

Student: 2,000.

Teacher: It could be 2,000.
And Shadia?

Student: 200.

Teacher: 200. So we have a low -- a range of anywhere between 10 and 3,000 bones. That's a very big difference.
You are going to get a chance to count your bones.

Student: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11.

Narrator: The teacher assigns each group a section of the body: The head, the arms and hands, the leg and foot or the torso, which includes the neck.

Student: It's eight.

Teacher: And Group 4, you did the torso, the body. How many bones did you count?

Student: 17.

Teacher: Let's find out how many bones we counted all together. 7 plus 8 is?

Student: 15.

Teacher: 15 plus 6 is?

Student: 21.

Teacher: 21 plus 17 is?

Student: 28?

Student: 38.

Teacher: 38. There you guys. You guys came up with 38 bones.

Teacher: The student count usually comes up short. You could ask the students what they could use to assist them in coming up with a more accurate count.

Teacher: There are actually more than 38 bones in your body. And I'm going to give you

some ways to help you find the rest of them. First off, I wanted to show you this. Now, where did my tack -- oh . . . all right. Does that look familiar to you?

Class: Yes.

Student: A body.

Teacher: That is your what, Samantha? You told us that's called your?

Student: Skeleton.

Teacher: Do you notice anything about him or her?
Ryan, what do you notice?

Student: There is more bones than there is in 38.

Teacher: I'm going to give each group a poster of the section of the body that they started counting. So this is our torso. This will go to Group 4. And it's just this section. And it will give them the actual bones to count. And then what I'm going to do is let you count the whole body in your group. But you're going to start with the part of the body that you counted on yourself. Okay?

Student: One, two, three, four, five, six, seven, eight --

Student: 7, 8, 9, 10, 11, 12, 13, 14, 15.

Student: Hey.

Student: 17, 18, 19.

Student: We're actually done.

Narrator: The groups switch posters so that all the groups get to count the bones on each poster.

Student: We'll go to the rib.

Student: What are these?

Teacher: Oh, those are these.

Student: Back bones.

Teacher: That's part of your -- that's right.

Student: 30.

Student: 30.

Teacher: 13 plus 2.

Narrator: The students come up with a more accurate count using the posters and skeleton photograph.

Student: 206.

Teacher: Are you shocked?

Student: Yeah.

Teacher: It's amazing, isn't it?

Student: Yeah, I thought it was 200.

Teacher: Can we go back a couple of steps to here where we were guessing?

Student: No.

Teacher: We had one guess that was very close, didn't we? This one right there. 3, 2, 1. It's pretty amazing you have that many bones in your body, right? Why do you think we need to have long bones in the leg?
Mark?

Student: To help you move.

Teacher: To help you move. Why else might you need long bones in your leg? Cecelia?

Student: So you can jump high.

Narrator: The class will continue to discuss the major bones and the function of the skeleton. It provides us with shape, protection and movement.

Teacher: They give us our shape. Absolutely.

Narrator: End the lesson by starting the Word Bank and Content/Inquiry chart. The most important thing for students to take away from this part is the function of the skeleton is to provide support, protection and movement.

There are several readings in the Science Stories about bones. Be sure to check the Science Stories folio. It will help you decide when to read these stories.

<Investigation 1, Part 2>

Narrator: In Part 2 of the bones investigation, students will assemble a paper puzzle model of a human skeleton. First they'll work from memory and then you'll pass out a paper with an accurate model for them to work from. Here is what you'll need for this part: from the kit you'll need the Mr. Bones Puzzles. Be sure that all 19 pieces and 18 paper fasteners are in each bag. Repair any torn holes with transparent tape.

You will need to duplicate the Student Sheet No. 3 called Bone Names and the Student Sheet No. 6 called Response Sheet - Bones which you can use for assessment. Have Assessment Chart for Investigation 1 available so you can make notes as you work with the students.

Check the Bone Name sheet to be sure you know the correct orientation of the bones. The students think Mr. Bones has two right hands. The thumbs both point in the same direction because one hand shows the palm and the other hand shows the back of the hand. Notice that the lower arms are different. The radius and the ulna are crossed when the thumb is close to the side of the leg and parallel when the thumb is pointing out.

Have students pose like this and feel their bones to understand the difference. Look at the rib cage. Students often confuse this and turn it upside down. Many students also confuse the arm and the leg bones. Show them the difference.

Begin this session by asking the students in each group to work in pairs.

Teacher: Today you are going to have an opportunity to put together a skeleton of your own with a partner.

Narrator: The getters get two puzzle bags for their groups.

Student: You better hurry up!

Student: I know.

Student: Here is the head.

Student: Make sure his head always stays up.

Teacher: Okay. What part of your body is this?

Student: The leg.

Teacher: The leg? You're sure?

Student: Yes. It's this bone.

Teacher: Where your top bone and bottom bones attach, what's in between?

Student: Hmmm --

Student: This is the top bone.

Student: Right here.

Student: This is the top bone.

Teacher: No. Those are your bottom bones in your leg.

Student: Because the bottom bone has muscles in between.

Teacher: Right. But I'm asking you about how they attach. Show me on your body where your legs attach your top and bottom bones.

Student: To the knees.

Teacher: Where is the knee on here? But that's not a bone. The knee is in the picture.

Student: Oh, right here.

Teacher: So what do you need to do?

Student: Turn it over.

Teacher: Thank you. Do that.

Student: I messed up.

Narrator: When most of the students have completed Mr. Bones, it is time to bring out the Mr. Bones photo and the Bone Name student sheets. Encourage the students to compare the illustration on the sheet to their puzzles and make any corrections that are needed.

After a class discussion about Mr. Bones, ask students to disassemble the puzzle being very careful not to tear any of the pieces. The students count to be sure that they have 18 paper fasteners and 19 puzzle pieces with the same symbol on the back. They place the materials in the zip bag and seal it.

Students can complete the Response Sheet - Bones at home or in the classroom. You may want to use this as assessment.

Now it's time to introduce the Project Folder. Students can write down their ideas that they want to investigate further on. They will get an opportunity to do this at the end of the module.

Remember, you need owl pellets for the next part.

<Investigation 1, Part 3>

Narrator: In Part 3, students will examine owl pellets. They will remove the rodent bones and compare them to the structure of human bones. Here is what you'll need for this part: From the kit you'll need the toothpicks. From the measurement kit you will need meter tapes.

You will need to provide owl pellets and paper plates or paper towels. You will need to duplicate the Student Sheet No. 7 called Owl Pellet Observation and the Student Sheet No. 8 called Rodent Bone Identification. Have the Assessment Chart for Investigation 1 available.

This part is a performance assessment. Before you begin, target some specific concepts and procedures that you will use to evaluate your students' performance.

This is what the owl pellets look like. Don't unwrap the pellets. Let the students unwrap them themselves and discover them. Have one owl pellet for every two students.

Plan time when doing the investigation for students to wash their hands when they finish working with the pellets. You may want to begin this part by reading the science story. It gives interesting background information about the barn owl.

Teacher: So you will have this whole owl pellet on your plate. And you'll look at it. And you'll look at what shape it is. And you'll touch it to see if it's smooth or bumpy.

You'll look what color it is. And you'll sort of draw a little picture of it. That's the first thing you'll do.

And when both you and your partner have done that, one of you will very gently just break it in half. And you'll put one half on one plate. And you'll put the other half on the other plate. And so that you each have your own to work on. And then after that, you don't have to touch it with your hands.

Student: Yeah.

Teacher: You have some toothpicks to work with.

Class: Yeah!

Narrator: Getters get the materials: Two owl pellets, two meter tapes, four paper plates, four to eight toothpicks and four student sheets for each group.

Student: Oh, what's that? Fungus?

Student: It looks like fungus.

Student: It looks like a rock.

Narrator: Although some children may hesitate to get involved, it is only a matter of minutes before they are so fascinated that they forget their feelings of hesitation.

Student: It smells like rat.

Student: Ms. Silver, what is actually in there?

Teacher: You'll find out. But right now we'll do size, shape, color, texture. Okay. You know what texture means, right?

Student: Wrap it around.

Student: 7 centimeters.

Teacher: Are you going to remember what you just measured? Okay.

Narrator: After the students have recorded their observations, they take the pellets apart.

Student: Oh, what happened to the other plate? There's only three.

Student: Cool.

Student: Oh.

Student: I see bones.

Student: I see rat bones.

Student: Oh, cool.

Student: Cool.

Student: I see even more bones.

Student: Hey, look. Look at the eyes. I think that's part of an eye.

Student: Oh.

Student: Is this a rib? Is this a real owl pellet?

Teacher: Yes, it is a real owl.

Student: How many bones did you find?

Student: A real rough one.

Student: Oh, somebody's head.

Student: Oh, my gosh. A head.

Teacher: Wow.

Student: This is fun.

Student: Yeah.

Teacher: Are you finding anything? I think -- oh, you want to make sure that these are separate from the stuff that's fur. Okay? They are very little. Look how little this is. I think you're a surgeon in the making. Are you going to be a surgeon?

Student: No.

Teacher: You might want to think about it, as a backup plan if singing doesn't work out.

Student: I found a little bone. Ahhh . . .

Student: Is this the hand?

Student: A part of one.

Student: Oh, my goodness.

Student: Oh, man.

Student: I think so.

Student: Ms. Silver, I found a hand.

Student: I think it's a hand.

Teacher: It could be a hand. We're going to have to figure it out. See if you can take some more of those little pieces of fur off.

Student: Look at my head.

Student: Look, an eye.

Student: Feathers.

Teacher: Making sure that you're splitting two piles. You have a pile of bones and a file of other stuff. You need to be filling in Part 2. If you haven't already started writing for Part 2, you need to be doing that. Cool.

Student: So I'll call it a shell.

Teacher: You and your partner will share this. So you pile all of your skulls together. And you pile all what you think are vertebrae together and all what you think are femurs together. You're going to put it on here, off your plate onto here. Okay? Okay. You're going to work together with your partner.

Student: Now put it right there.

Student: I know. I just . . .

Student: We both got part of the teeth.

Student: Ms. Silver.

Student: Ms. Silver, we got part of the teeth.

Teacher: Okay. Can we start by categorizing first? This is very cool, but you guys are just one step ahead of me. So you know those are skull parts. So put it there. You have a whole bunch of other bones here you want to try to figure out where it is. That's also very cool. But I want you -- what I want you to do is take your bone parts and see if you can figure out where they go here and here.

Student: This one goes up here.

Narrator: The class discusses the bones they have found. How are the animal bones similar to human bones? How are the animal bones different from human bones? When these questions have been addressed, the students begin to reconstruct the skeleton on their sheets.

Here is one student sheet as it looked at the end of the session. Allowing more time, the students will discover more bones to complete their skeleton. When they've completed it, allow it to dry and cover it with plastic wrap. It makes a nice display to put on the bulletin board.

The important things for the students to learn in this part are some rodent bones are very similar to human bones and some rodent bones are very different from human bones.

This brings us to the end of the Investigation 1. Be sure to select several of the interdisciplinary activities and do the math problem of the week before moving on.

<Investigation 2, Part 1>

Narrator: In the first part of this investigation, the students will look at where bones meet and the advantages of an opposable thumb. Here is what you'll need for this part: From the kit you'll need masking tape and the life size photo of the human skeleton.

Be sure to make copies of the duplication Student Sheet No. 7 called Thumb Joints. Make a copy of the Assessment Chart for Investigation 2, which you should keep with you so you can make notes about how your students are working.

Practice taping your own thumb to your index finger for immobilization. When you tape, make sure you tape the tip and make sure you tape so this part in here is covered.

Begin this lesson by reviewing what the students have learned about bones.

Teacher: Can you tell me what you have learned about skeletons and bones so far?

Narrator: To help students recall, the teacher asks: How many different ways can you move your body? What are the functions of the skeleton? What is the structure of the skeleton? Are all bones structured in the same way? Where does your body bend?

They should respond that the body bends where two bones meet. Explain that those places are called joints. When a hard skeleton is able to bend, it is called articulated. The teacher asks the students to look at their hand and try to count the joints. There are 14. But the students usually come up with a shorter count.

The students will complete a worksheet with simple activities. Color the picture and solve the maze. But they are going to have the two joints in their thumb immobilized. The teacher is demonstrating how to tape the thumb so they won't have the benefit of an opposable thumb.

Teacher: You are going to wrap a piece of tape around your thumb and your finger. Okay? To keep it from being useful to you. Okay.

Narrator: The Getters need to get a roll of masking tape and a student sheet for each student in their group.

Student: Should I do both of your hands first?

Student: Yeah, I guess.

Student: Thumb stuck?

Student: Yeah. Like that.

Student: It's going to need a little bit more tape because look.

Narrator: The simple act of holding a pencil to follow a maze becomes quite a challenge.

Student: Do you need help?

Student: This is hard.

Narrator: Point out that this is not allowed because it's like using his thumb. Erasing is

not easier. And holding a crayon to color is difficult.

Students will find zipping a jacket is difficult.

Student: It's not funny, April.

Narrator: So is tying a shoelace. Buttoning a sweater is also difficult.

Student: I can't.

Narrator: And so is buckling a belt. The students rate their experiences on their student sheet.

Teacher: What tasks were hard to do?
Camella?

Student: Trying to hold a pencil and trying to tie the shoes.

Teacher: Rico?

Student: The zipper.

Teacher: Philman?

Student: Tying the shoe.

Student: The button.

Narrator: The students report what made the actions hard. They tell how they solved the problem and agreed that an opposable thumb is very important. In this part, students should have learned how important opposable thumbs are in everyday tasks. Without a thumb, it's very difficult to tie a shoe, zip a jacket or button a shirt.

Check the folio on the FOSS Science Stories. You may want to read the story on the opposable thumb before going on to the next part.

<Investigation 2, Part 2>
Narrator: In this part, students will continue to explore joints. Half the students will disable their thumb joint by taping it. The other half of the students will disable their index and middle fingers by taping them. Then they will explore eight task activities.

Here is what you'll need for this part: Masking tape, the 18 centimeter dowels, the craft

sticks with no holes and the task bags that have already been prepared. Remember, have Assessment Chart 2 available.

To begin Part 2, discuss the students' experiences when their thumbs were taped. Show the students how they will immobilize the joints in their index and middle fingers or their thumb joints.

Teacher: Tape your hand where your fingers are taped and then you'll wrap it around both your fingers and the dowel. Again, not so tight that you're going to cut off your circulation. Okay. Thank you.

Narrator: Half the class will tape a dowel to their index and middle fingers and to the wrist on both hands. The other half will use a craft stick taped to their thumb and wrist.

Teacher: Okay. Now can you move your hand?

Student: No.

Teacher: All right. Very good. Thank you.

Narrator: Then go over the eight tasks so students will know what to do once their fingers or thumbs are immobilized.

Teacher: One in front of each group member. Okay.

Student: Oh, yeah, almost. And then I have to do hers.

Student: Don't pull it too tight.

Narrator: Then they begin passing the task bags from group to group so everyone tries all the tasks. The tasks are stringing a paper clip on a piece of string and tying the ends of the string. Joining paper clips together to make a bracelet. Cutting a circle out of a 3 by 5 card and tacking it to the bulletin board.

Unscrewing a cap from a bottle. Pouring corn kernels from the vial into the bottle and back again and then replacing the cap. Putting three corn kernels on a 3 by 5 card and taping them in place. Making four piles of pennies and putting one pile in front of each group member. Rolling up a newspaper, putting a rubber band around it and putting it into a plastic bag.

Student: I'm so good.

Narrator: Writing a letter, putting it into an envelope, and putting a sticker on the envelope.

Student: I got it.

Student: I can't write.

Student: I can't write right.

Narrator: When students have completed all eight tasks, have them share their observations and experiences. Encourage students to add their ideas and questions to the Project Folder.

The students should understand that having an articulated skeleton allows people to move in many ways. Without articulated bones in the hand, simple tasks become very difficult.

<Investigation 2, Part 3>

Narrator: In this part, the students will learn the names of the different joints in their body. Here is what you'll need for this part: From the kit you'll need the hinge, the mallet, the 5 milliliter spoon, sticky labels and the photograph of the human skeleton.

You will need the Student Sheet No. 3 called Bone Names. If the students already have these sheets, ask them to take them out or duplicate a few more for those students who may have lost them. You'll also need the Student Sheet No. 12 called Response Sheet - Joints. Use this sheet to take a closer look at students' understanding of joints. Have Assessment Chart for Investigation 2 available.

Begin this session by reviewing with students their experience with immobilized joints. Which tasks were harder to do and why? How did they compensate?

Teacher: Today we're going to be talking --

Narrator: Then go on to tell the students that they will look at the different kinds of joints in their bodies.

Teacher: There are different kinds of joints. The first kind is the hinge joint. Okay? And the hinge joint moves like this. This is a hinge joint. And it's where your elbow moves. Okay?

And it's like a hinge that you would find on a door. It's the same kind of movement. And notice that the hinge only moves in one direction. Okay? Like your elbow. All right? It can only move in one direction. Just like your elbow. That's how the hinge moves.

Okay? It can't move any other way. What other hinge do you think you have on your body?
Darian?

Student: Your leg when you go like this.

Teacher: Stand up and show me what you mean.

Student: Just like this. When you go like this --

Teacher: Uh-huh. What other part can do that? You told me. Say it again.

Student: When you move your knee.

Teacher: That's right. Exactly. Very good.

Narrator: Point out that the finger joints also move like a hinge. Continue with the ball and socket joint. The ball and socket joint moves in a rotating motion like this, just like my shoulder. Explain that the ball and socket joint can move in all directions. The students find ball and socket joints in their bodies.

Teacher: All right. And the next one is the gliding joint. Okay? And the gliding joint can only move in --

Student: Sides.

Teacher: In two directions. Side to side like that. And up and down. Up and down. Side to side.

Narrator: Help the students find gliding joints in the wrists, ankles.

Student: Ankles.

Teacher: And the neck.

Student: The neck.

Teacher: Your neck also is a gliding joint.

Narrator: Next hand out sticky notes for each group to write its choice of one type of joint to identify.

Student: All right. Ball and socket.

Teacher: Now, let me see a show of hands. Who would like to come up and identify a joint on the skeleton?
Darian, bring up your Post-it. Which joint are you doing?

Student: Ball and socket.

Teacher: Okay. All right.
Shawna, which joint do you have?

Narrator: The ball and socket joints are the shoulder and hip joints. The hinge joints are the knee, elbow, toe, finger and thumb joints. All the other joints are gliding joints. After reviewing the labels on the skeleton photograph, the students begin to label the joint names on the student sheet.

You can assess the students' understanding of joints by having them complete the response sheet called Joints.
The students should understand that they have three different types of joints in their body that allow them to move differently.

<Investigation 2, Part 4>
Narrator: In this part, students will demonstrate their understanding of bones and joints by using plastic bones to construct a leg. Here is what you'll need for this part: From the kit you'll need bags of plastic chicken bones and bags of plastic rodent bones. Duplicate the Student Sheet No. 13 called Bone Observations. Have Assessment Chart for Investigation 2 available.

Remember, this is a performance assessment. Be sure to visit with each group. Be sure you are familiar with the model bones. The chicken leg model has a femur which has a nice ball here where the femur would connect to a hip bone and a tibia/fibula. The tibia/fibula and the femur form a hinge joint like this.

The rodent bones have three parts. The hip bone, which has a nice socket and a femur which has a nice ball on the end of the joint. This ball fits into the socket of the hip bone forming a ball and socket joint. Then the tibia/fibula connects to the lower end of the femur with the hinge joint.

Begin this part by reminding students that the shape of the bone is related to the joint. Ask the students to observe the model bones and to record their observations on the student sheet before they fit the bones together to see what kind of joints the bones form.

Student: Alyssa, do you get this, putting it together?

Student: I think like that. Is it like this? Like that.

Student: Oh, good. I'm just trying to figure it out.

Student: This goes here.

Student: Close enough.

Narrator: This brings us to the end of Investigation 2. Be sure to select several of the interdisciplinary activities and do the math problem of the week.

<Investigation 3, Part 1>

Narrator: In this part, students will build a model of the leg in order to demonstrate how muscles move feet and legs. Here is what you'll need for this part: From the kit you'll need the 18 centimeter dowels with holes, the regular sized paper clips, the 11 centimeter craft sticks with holes, the rubber tubes with holes, large rubber bands, the leg muscle transparency and the rubber tubes with no holes.

You'll also need the leg/foot poster. From the measurement kit you will need the basins and the half liter containers. These items are optional but they are very useful in helping you organize the materials. In preparation, duplicate the Student Sheet No. 14 called Muscle Names and the Assessment Chart for Investigation 3.

Practice making a leg model. Connect the two dowels which are the upper and lower leg bone with a rubber tube that has no holes. The stick should be pushed into the rubber tubes which represent the knees until they touch. The holes in the dowel should be aligned directly over one another.

Slip a rubber tube with a hole over the end of one dowel. The hole through the tube should be at a 90 degree angle. Push the end of the popsicle stick with the holes -- it represents the foot -- through the hole in the rubber tube. There will be one hole on each side of the rubber tube.

Open up six regular paper clips to make C hooks. These simulate tendons. The smaller hook of the C attaches to the rubber band which represents the muscle. The larger part of the hook will connect to the wooden dowel. This one I'm going to attach from the back of the knee up to the femur.

Here is a completed model of the foot. Notice that the lower leg muscles attach just below the knee. To simulate muscle contraction, pull the two ends of the rubber bands

together.

Begin this session by asking the students to remember the rope jumping that they did in Investigation 1.

Teacher: So today we're going to talk about how our muscles work in our bodies. And Samantha just helped us by telling us that they don't work alone. They work with our bones. Right? Where do you have muscles in your body?
Christian?

Student: You have your muscles right here. This is your leg muscle. This is your arm muscle. And like -- when something is real heavy, you need to use your arm muscles. Because if you don't use your arm muscles, it can fall down and you can fall.

Teacher: You mean something you're carrying. Okay. So he showed us this muscle in the back of his leg. And he showed us this muscle in the top of his arm. Any place else?
Erwin?

Student: Right here by his gut.

Teacher: Right here by your gut. Yeah, you have muscles there. Where else?
Ryan?

Student: Somewhere right between your knee and right here.

Teacher: Okay. We have a really good muscle we can all find. Put your arm out like this. Make a fist. Bring it right up tall. Now feel right there.

Narrator: Ask the students to continue feeling the muscles in their body. They should feel the jaw, the lower arm, the upper leg and the calf. They should notice that when their muscles work or contract, that the muscle becomes harder or shorter. They should also notice that bones are pulled towards each other when a muscle contracts.

Teacher: So this is a drawing of a leg muscle the way it would be in your leg.

Narrator: There are over 650 muscles that work in the human body.

Teacher: I'll turn it so you can see the whole thing. And on the ends we have what are called the tendons. Can you guys say tendons?

Class: Tendons.

Teacher: This is what attaches that muscle to your bone. It's your ankle --

Narrator: The teacher shows how the muscles are attached to the bones on the poster and on her own leg.

Teacher: Feel how it stretches all the way out. And then let's try standing on both feet. And go way up high on your tiptoes. And reach down and feel the muscle in your leg, in the back of your leg. So you feel that muscle feel hard?

Narrator: Now students will try to find other working muscles in their bodies.

Teacher: Go back a little bit. And then bend forward a little bit. Does it feel the same?

Class: No.

Student: I have a four pack.

Teacher: Did you find a muscle, Tuva?

Student: Right here.

Teacher: So you opened your mouth and you could feel it. Can you guys try that? Way back next to her ear is where she's feeling it.

Student: I feel it, too.

Teacher: So pretend like you're chewing and feel it. That's neat. Where is another one?

Narrator: They will also feel the muscles when they open and close their hands, shrug their shoulders and bring their knees up toward their waist. The students will now put together a model of the leg.

Teacher: How do you know this is a leg? I didn't even have to tell you.

Student: See, it looks like that.

Teacher: It looks like this. You're right, it does.

Narrator: Walk around and check that the students have put the bones together correctly. Then the students open the paper clips and begin constructing the muscles and tendons.

Student: Start up here.

Student: It bends.

Teacher: Oh, that's cool. So you can make it be like a ballet dancer.

Okay. Now make sure it works.

Narrator: The teacher helps students describe what their models can do by comparing the models to her own legs and foot. The children will do the same. They will also find they can move their own legs in ways that their models can't.

Teacher: Raise your hand if you think you can read to me one of the names of the muscles in your leg.
Christian?

Student: The tibia -- the tibialis.

Teacher: Tibialis. Very good. The tibialis is in the lower part of the leg.
Samantha?

Student: Biceps.

Teacher: Samantha sees biceps. Samantha, are they on the top part of the leg or bottom part of the leg?

Class: Top.

Teacher: Are they in the front of the leg or in the back.

Student: Back.

Teacher: Back. You have biceps back here.

Narrator: In this part, students have been introduced to the muscles. The muscles provide movement and contract when they work. Tendons are rope-like tissue that connects muscles to bones.

There are several great readings about muscles in the FOSS Science Stories. Be sure to check the folio so you'll know when to read them with your students.

<Investigation 3, Part 2>
Narrator: In this part, students will construct a model of a thumb. Here is what you need

for this part: From the kit you'll need string cut in 30 centimeter pieces, the craft stick with no holes, twist ties, rubber tubing with no holes, craft stick with holes, the arm muscle transparency and the arm and hand poster.

From the measurement kit you may want to use the basin and the half liter containers to organize your materials. Copy Student Sheet No. 17 called Response Sheet - Muscles and have the Assessment Chart for Investigation 3 available.

Practice making a model of the thumb. Use two rubber tubes with no holes to connect two short craft stick pieces and a whole craft stick with no holes. The sticks represent the bones and the rubber tubes represent the joints. Run the end of a 30 centimeter string that will represent the tendon through the hole in the last segment of the thumb. Tie the knot so that it will not pull through.

Use twist ties to form guides. These will represent the ligaments for the tendons at the two joints. Make sure the twist ties are not too tight. Operate the thumb by pulling on the string simulating the arm muscle as it pulls on the tendon.

Begin this part with a discussion of the leg model and how it worked.

Teacher: The rubber bands represent?
Michael?

Student: The muscles.

Teacher: The muscles. The paper clips represent?
Shadia?

Student: Tendons.

Teacher: Good. You remember all of the parts of the leg. That's great. What happens to these muscles when we use them?
Ritchie?

Student: They contract.

Teacher: They contract. Put out your hand like this. Make it into a claw like you're an eagle. And look at it on the inside. And put it back out straight. Make another claw. Look at the back. Tell me what you see.
Marcus, what do you see?

Student: Your bones.

Teacher: You see the bones on the back of your hand. Keep making a claw and opening your hand. And while you do that, hold onto your arm just below your elbow.

Narrator: As the students move their fingers, they can feel the muscles in their arms contracting. The teacher explains that the fingers are moved by tendons attached to the muscles in the arm. She holds the arm muscle transparency over the arm and hand poster so the students can see how the tendons are attached to the muscles and fingers.

Teacher: Here and here are the tendons attaching to your bones. If you make a claw again but while you're doing it, feel on the back of your hand. Open, close. Open, close. You can feel the tendons moving. And the same thing on the inside. If you just gently hold it here and make a claw and open, you can feel the tendons moving there, too.

So today you're going to make a model of the thumb very similar to the leg you made.

Narrator: After the teacher shows the students the parts, the getters get two bags for their groups and the students begin construction of the bones and joints.

Student: I got this one.

Student: I'll tighten it.

Student: Yeah.

Student: Not too tight; not too tight.

Student: Like this.

Narrator: Some students will spontaneously compare the movement of the model thumb to their own thumbs but the teacher asks the class to make the comparison to be sure everyone sees how muscles in their arms move their thumbs.

The most important thing for students to remember is that ligaments act as guides for tendons and that they attach bone to bone. Continue to add student ideas to the Content/Inquiry chart and to the Project Folder.

<Investigation 3, Part 3>

Narrator: In this part, students will construct a model of the arm. Here is what you'll need for this part: From the kit you'll need regular sized paper clips, 18 centimeter dowels with holes, tubes with no holes and the large size rubber bands.

From the measurement kit you may want to use the basin and the half liter containers to organize your materials. Duplicate the Student Sheet No. 18 called Muscle Action. Remember, this is a performance assessment. Have the Assessment Chart for Investigation 3 available.

Practice making an arm model. Connect two dowels, the upper and lower arm bones. The sticks should be pushed through the rubber tubing which represents the elbow joint until they touch. The holes in the dowels should be aligned directly over one another.

Open up two paper clips to make C hooks. The smaller hook of the C attaches to the rubber band. The larger end attaches to the hole in the dowel. Use the paper clip tendon and attach it with one large rubber band to the upper arm. And use the other C hook and attach it to the lower arm. This represents the bicep muscle. Pull the two ends of the muscle together or the rubber band to simulate contraction.

Begin this part with a discussion of the leg and thumb models and how they worked. Review with students how the models were put together and what the parts represented. Remember, this is a performance assessment. As you walk around and observe your students, take the assessment chart with you.

<Investigation 4, Part 1>

Narrator: In this investigation, students experiment with hand and foot responses to visual stimuli. Here is what you'll need for this part: From the kit, plastic cups with holes, plastic lids with holes, binder clips and 35 centimeter dowels. From the measurement kit you will need meter tapes.

You will need to provide half sheets of paper and transparent tape. Student Sheet No. 19 called Stimulus and Response will need to be duplicated along with the Assessment Chart for Investigation 4.

Here is how to assemble the falling cup device. Take the cup and snap it on the lid like this. Slide a long dowel through the hole so that it goes through the lid and the cup. And make sure that it slides freely up and down. Hold the stick in a vertical position on a desktop with the cup bottom side up. Attach a binder clip to the dowel above the cup to limit how high the cup can be raised above the desktop.

To prepare the vision guide, take transparent tape and a half a sheet of paper. Tear off a small piece of tape and place it on the paper. Then take the cup. I'll put the tape right at the top of the cup. What this does is it hides your hand so the student wouldn't see your hand when you release the cup.

Begin this session with a review of the body parts that come into play when people move.

Teacher: What kinds of systems come into play?
Jared?

Student: The joints.

Teacher: That's right, the joints. What else?
Camella?

Student: The muscles.

Teacher: Muscles. Okay.
And Narisa?

Student: Bones.

Narrator: The teacher goes on to explain that there are triggers that start an action. And that trigger is called the stimulus. Some kinds of stimuli are pain, hot and cold, touch like a tickle or an itch. Sight, sound, smells and taste also act as stimuli that cause a response.

Teacher: Do you think that Constance is going to be able to move her hand before I drop the cup?

Student: No.

Student: No.

Teacher: Okay. I want you to pull your hand away when you see the cup falling. Okay? All right.

Narrator: The teacher goes on to tell the students that they will have an opportunity to test their own responses to the falling cup stimulus. She shows them how to construct the device.

Teacher: It's attached firmly at the top. And that your cup is -- has the dowel going through it. Okay? So that's what you are going to be working with next.

Student: One more time.

Student: I got it.

Narrator: After some practice the teacher asks them how to find a standard release

height. They decide on 24 centimeters. So they measure the cup height and adjust the clip to get a distance of 24 centimeters.

Student: This is 24.

Narrator: Next the students practice their responses using the vision barrier. So their only visual clue is the cup beginning to fall.

Student: Gotcha.

Narrator: After the students have practiced with the vision barriers, introduce the Response Time sheet and tell the students that they will record hits and misses. Once they reach five either hits or misses in the column for the right hand, have them label the boxes and test their left hand. The children begin to record their results to see if they can improve their response time with practice.

Student: The paper.

Student: Finally I got it.

Student: Got you.

Student: After both partners test both hands, they test their feet.

Teacher: Which body part responded the quickest to the falling cup?
Narisa?

Student: The hand.

Teacher: Okay. And which was the slowest?
Darian?

Student: The foot.

Teacher: Okay. Why do you think that might be? Why do you think that's the case?
Philman?

Student: Because you can see faster to the hands than to the foot.

Teacher: Very good. Do you think there is anything that you could do to improve your response time?
Karema?

Student: You can practice.

Teacher: Absolutely.

Narrator: Leave the materials out so students can practice before the next part. Students should understand that visual stimulus helps people respond to falling objects and it takes longer for feet than hands to respond to a visual stimulus because of the greater distance the message must travel. Be sure to check the Science Stories folio and plan time for reading.

<Investigation 4, Part 2>

Narrator: After the students have had time to practice, they will conduct the response activity again. Here is what you'll need for this part: From the kit: Plastic cups with holes, plastic lids with holes, binder clips and 35 centimeter dowels.

From the measurement kit you will need meter tapes. You will need to provide half sheets of paper and transparent tape. You will again need to duplicate Student Sheet No. 19 called Stimulus and Response. The students should have a copy of this from Part 1 and they should bring it out for this part for comparison. Have Assessment Chart for Investigation 4 available.

Begin this part by distributing a new student sheet and allowing some warm-up practice.

Student: Hit.

Student: Hit.

Narrator: The students find their response time does, indeed, improve with practice. The students conclude that response time gets quicker with practice and that practice increases muscle strength. This is a good time to encourage students to add their new ideas and questions to the Project Folder.

<Investigation 4, Part 3>

Narrator: In this part, students will actually time their responses. Here is what you'll need: From the kit you'll need the 35 centimeter dowels. You need to provide transparent tape. Duplicate Teacher Sheet No. 20 called Response Timer. Then duplicate the Student Sheets No. 21 called Timing Responses and No. 22 called Response Sheet - Coordination. This one can be used as an assessment.
Have Assessment Chart for Investigation 4 available.

To make a response timer, cut the strips apart. Tape the strip to the dowel aligning the

starting position with the end of the dowel. Now you have a response timer.

Begin this lesson by explaining to students that they can find out how quickly they respond to a stimulus by making a response timer.

Teacher: It's not as easy as it looks. Okay.

Student: Oops.

Teacher: Okay. Again? Okay. Good. Okay. Now stop right there. Now ideally you are going to catch it somewhere on the paper strip so that you can measure the number that is your response time. Okay?

All right. Try it again. Okay. Stop right there. Okay. You're getting closer. But -- and it looks like it was 21. Okay.

Narrator: The No. 21 represents 21 hundreds of a second. That's pretty fast.

Student: 22.

Student: Okay.

Narrator: Missing the dowel or catching it above the timer strip doesn't count. Students will keep trying until they've caught it five times and record their data. Then it's their partners turn.

Student: Do it again.

Student: 18.

Student: 18, right?

Student: I can get 21.

Student: Like this.

Student: Oh, yeah.

Student: 18 again.

Student: One more.

Student: 19.

Student: We're finished.

Student: Wait. Let's do the fastest response time.

Narrator: To find the average, you can use the strategy that your class is most comfortable with. This is the end of Part 3.

<Part investigation 4, Part 4>

Narrator: The last part of this module gives students an opportunity to choose their own investigation. Students may choose something that's of interest to them. And it gives you an opportunity to see how well they understand the Human Body module.

This is the time to bring out the Project Ideas Folder. As much as possible, you want students to use their own ideas and investigate the questions that they have come up with during the module. If you don't have enough ideas in the Project Folder for everyone to investigate, you can use the Project Ideas sheet to help students think about more investigations.

The project plan sheet should be completed by each student or team of students doing a project. This should help you control materials and keep tabs on what the students are working on. You will also want to make sure that the projects the students propose are realistic and will be of some benefit to the class.

You should plan to give the students about two weeks to work on these projects. You can give them class time or you may ask them to do some of the work at home.

The Assessment folio has suggestions for scoring the student work on the projects. Also in that folio you will find information and masters for the two kinds of summative assessment: An end-of-the-module test given in a variety of formats and suggestions for assembling portfolios.

This is the end of the Human Body module. Keep in mind there are details in the Teacher's Guide that we weren't able to share with you on video. My students and I really enjoyed this module and I'm sure you will, too.